Nov. 8, 1966 W. V. GOODHUE 3,283,490

FALSE TWIST SPINDLE

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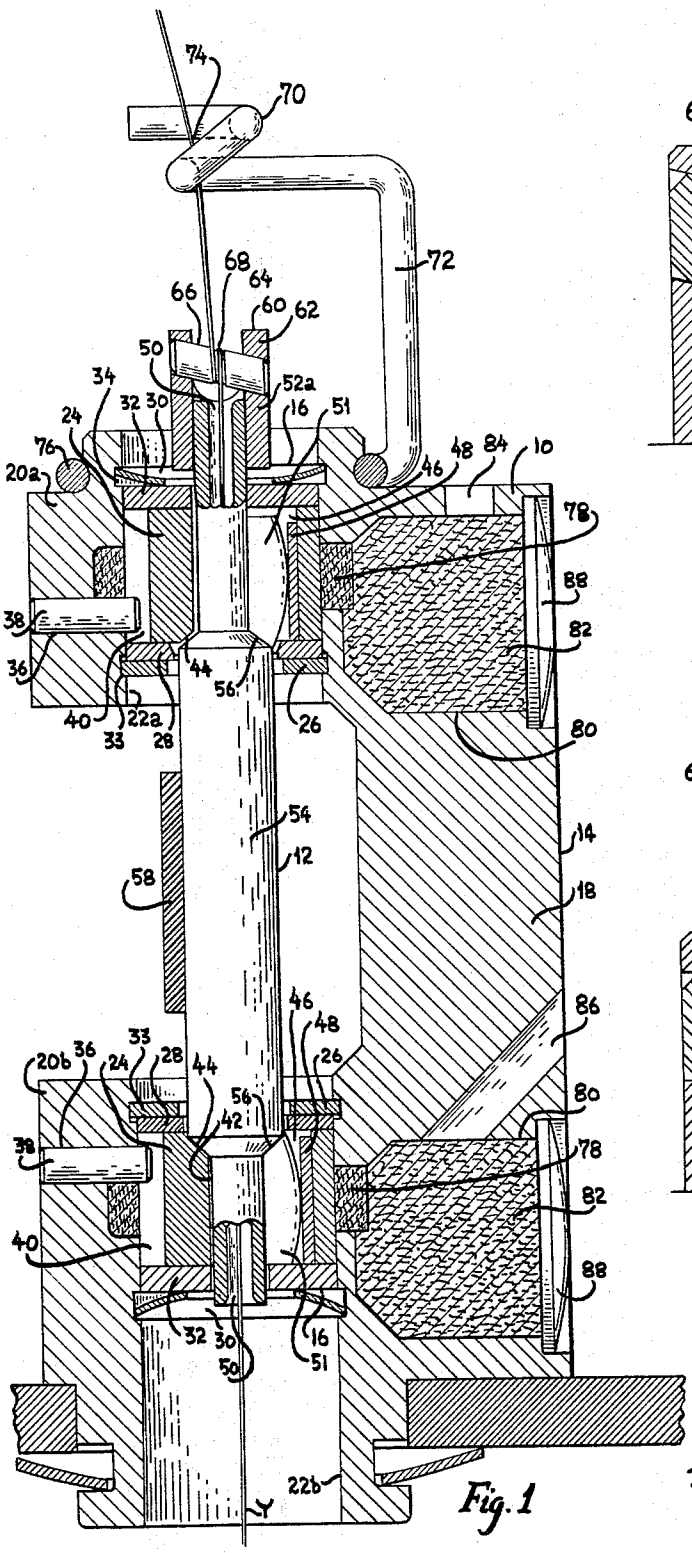


Fig. 1

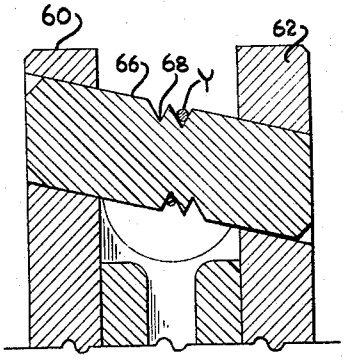


Fig. 3

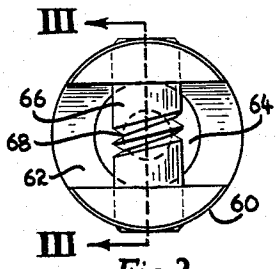


Fig. 2

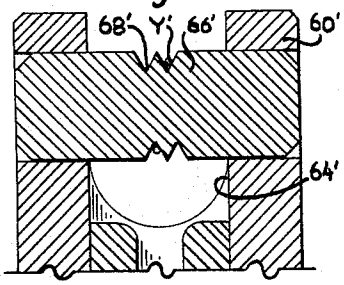


Fig. 4

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FALSE TWIST SPINDLE

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The present invention is concerned with textile machinery and, more particularly, with "false twist" spindles.

In recent years, "crimped" synthetic yarns have found widespread consumer acceptance. The process most often used for imparting the crimped structure to the yarn involves twisting the yarn, setting the twist, and untwisting the set yarn in a continuous, uninterrupted operation. Such processes are most commonly carried out through the use of so-called "false twist" spindles. In general, such false twist spindles each comprise a rotating body having an axial channel therein through which the yarn is passed, and a yarn engaging means which is attached to and rotates with the body and which serves to prevent free twist migration of the yarn. Usually the yarn engaging means comprises a looping means around which the yarn may be looped as it is drawn through the spindle. A simple pin positioned across the path of the yarn through the spindle and around which the yarn may be looped for one or more complete turns has been found particularly useful. Such a pin is commonly referred to as a twist trapping pin.

In operating the false twist spindles, it is desirable that they rotate at high speeds, e.g., at least 50,000 r.p.m., in order to impart as many twists as possible per inch to the yarn. Suitable spindles of this type are known such, for example, as those taught in U.S. Patent No. 3,044,247 to Richard G. Hilbert, which have special bearings and lubricating systems which accommodate speeds of at least 150,000 r.p.m. Although the false twist spindles, which have been available up to the present time, have provided satisfactory results, it has been found that undesirable breaks in the yarn sometimes occur, necessitating the shutting down of the equipment. The present invention is concerned with providing improved false twist spindles which substantially reduce the number of breaks which occur in the yarn during the crimping process.

One object of the present invention is to provide improved false twist spindles.

Another object of the present invention is to provide improved high speed false twist spindles which substantially reduce yarn breakage during use.

A further object of the present invention is to provide an improved false twist spindle provided with a novel twist trapping pin configured to arrest twist migration in the yarn to a high degree of effectiveness.

Other objects and advantages will be apparent from the following detailed description of illustrative embodiments of the invention when read in conjunction with the accompanying drawings in which:

FIGURE 1 is an enlarged detailed view of a "false twist" spindle of the present invention, partly in vertical cross section;

FIG. 2 is a top view of the yarn engaging means of the present invention;

FIG. 3 is a vertical cross-sectional view of the yarn engaging means of the present invention along lines III—III of FIG. 2; and

FIG. 4 is a view similar to FIG. 3 illustrating a modified form of the invention.

It has been found, in the present invention, that a substantial reduction in the number of shut-downs due to yarn breakage may be made by providing a continuous channel on the yarn engaging means to hold the yarn and define the yarn path on said means. The invention has been found particularly useful in false twist spindles employing twist trapping pins as the yarn engaging means. In such spindles, a simple, continuous, helical channel around the pin has been found quite useful in cutting down the number of breakdowns. Apparently such channels exert a positive hold on the yarns and prevent them from binding or abrading on themselves at the high speeds at which the spindles are rotated. Moreover, by virtue of the present invention a twist trapping pin is provided which has a V-shaped helical groove. Thus, the yarn is wedged into the groove as it passes through the spindle. Hence, whereas in prior art spindles it was to accept substantially full wraps of yarn, i.e., approximately 360° of engagement between the yarn and the twisting trapping pin, or some general multiple of 360°, in practice with the present invention intermediate values can be attained. That is to say, by the simple expedient of opening or closing the angularity of the opposing side walls of the V-shaped helical groove a wedging condition provided thereby acting on the yarn can produce a gripping contact more effective than, say, 360° of yarn wrap.

If it be assumed, let us say, that 540° of wrap contact between the yarn and the surface of a cylindrical prior art twist trapping pin would provide the optimum twist trapping condition for a given yarn, obviously, this value of 540° could not be achieved in the prior art since, as already stated, the yarn would have to be wrapped on such pins for one or more substantially full turns. Thus, in the past it would have been necessary to accept some compromise at either a wrap angle of approximately 360° or, in the alternative, about 720°. In contradistinction thereto, the present invention admits of providing, by means of a V-groove, an effective gripping force which can be equated to a wide variety of wrap angles. This is attributable to the wedging effect of the yarn in the V-shaped groove formed around the periphery of the twist trapping pin.

In general, the false twist spindles of the present invention comprise a rotatable body, means for rotating said body, a channel in the rotatable body through which the yarn is passed and a yarn engaging means attached to and rotatable with the body; the yarn engaging means having a continuous channel thereon defining the path the yarn follows around the engaging means when the spindle is in operation.

In FIGS. 1 through 3 there is shown a preferred embodiment of the present invention in combination with a high speed false twist spindle, such as disclosed in the above-mentioned U.S. Patent No. 3,044,247. The spindle **10** shown in FIGURE 1 consists essentially of a spindle blade **12**, a housing **14** and journals or bearings **16** in the housing for engaging the ends **52***a* and **52***b* of the spindle blade **12**. The housing **14** is a C-shaped metal block having a thick flat back portion **18** and a pair of legs **20***a* and **20***b* extending from the ends of the back portion **18**. Each of the legs **20***a* and **20***b* has, passing therethrough, coaxial, equal-diameter, cylindrical bores **22***a* and **22***b*, whose axes are parallel to the plane of the back portion **18**.

Each of the bores **22***a* and **22***b* is adapted to receive a cylindrical, plug-like bearing mount **24**, fabricated from a porous material such as sintered bronze through which oil may permeate. The two bearing mounts **24** are substantially identical in configuration and have diameters slightly less than the diameters of bores **22***a* and **22***b* to facilitate their insertion therein. The bearing mounts **24** are held in the bores **22***a* and **22***b* on the inside ends, i.e.,

the ends closest to the spindle blade **12**, by split retaining rings **26** and on the outer ends by bowed or dished retaining rings **30**. Between the retaining rings **26** and **30** and the bearing mounts **24**, annular spacing washers **28** and **32**, respectively, are disposed which serve to shield the mounts **24** from dust and the like. The retaining rings **26** and **30** engage internal grooves **33** and **34**, respectively, which are provided for that purpose in the walls of the bores **22***a* and **22***b*. In order to insure proper radial alignment of the bearing mounts **24** there is provided a small cylindrical passage **36** which extends transversely to the axis of the bores **22***a* and **22***b* and through the annular walls of each of the legs **20***a* and **20***b*. Through these transverse passages **36**, positioning pins **38** are inserted until the internal ends of the pin **38** engage a recess **40** provided in the outer surface of each bearing mount **24**.

Each bearing mount **24** has a small central axially directed bore **42** which is coaxial with bores **22***a* and **22***b* and which has internal ends **44** which flare outwardly at a relatively large acute angle. Two substantially identical radially extending channels or slots **46**, positioned at about an arc of 90° from one another, are cut from the central bore **42** into each mount **24** (only one slot **46** is shown for each mount **24**). The slots **46** extend radially into the mount **24** for about half the radial thickness of the mount **24** and extend longitudinally for about the full length of the small bores **42**. At the back end of each slot **46** there is positioned a metal plate **48** which is roughly coterminous with each slot. On top of the plates **48** are inserted wear-resistant bearing mounts **51** or journals which extend a small distance into the central bore **42**.

The spindle blade **12** is of generally elongated cylindrical configuration having an axial bore **50** extending through the full length thereof for passage of the yarn, the lower end of the bore being flared. Adjacent each end, the diameter of the blade is substantially reduced as compared to its normal diameter, the reduced end portions **52***a* and **52***b* serving as bearing surfaces for the spindle **12**, while the mid-portion **54** functions as a whorl. At the transition of the mid-portion **54** to each end portion **52***a* and **52***b* is a shoulder **56** tapering at an angle roughly complementary to the angle of the flared internal ends **44** of the bores **42**. The mid-portion **54** of the spindle **12** engages an endless belt **58** which serves as a drive means. The endless belt is positioned opposite the journals **51** and a small amount of lateral free play is provided between the reduced end portions **52***a* and **52***b* of the spindle **12** and the central bores **42** so that during use the end **52***a* and **52***b* and shoulder **56** portions will be forced against the bearing surfaces of the journal **51** and away from the walls of the central bore, thus causing the journals **51** to bear the brunt of the load.

A yarn engaging unit **60** is attached to the top end portion **52***a* of the spindle **12**. In general the yarn engaging means comprises a cylindrical coupler **62** which is fixedly attached to the top end **52***a* of the spindle. The coupler has a bore **64** therein which leads into and is coaxial with the bore **50** of the spindle. A twist trapping pin **66** is attached by its ends to the walls of the cylindrical coupler and traverses the bore **64**. The trapping pin **66** which is generally cylindrical in shape is, as shown, fixedly attached to the coupler. A V-shaped, helical channel or groove **68** which is adapted to receive the yarn is cut into the cylindrical surface of the trapping pin **66**. The length of the groove **68** may be varied depending upon the number of times it is desired to loop the yarn around the trapping pin **66**. Generally the groove **68** is of sufficient depth to hold the yarn in place and prevent it from sliding along the pin **66** and binding and locking upon itself. The pin **66**, in preferred embodiments, is pitched so as to intersect the axis of the bore **64** at an angle of less than 90°, e.g., about 50° to 80° and conforming with the helix angle of groove **68**.

A yarn guide **70** is positioned above the yarn engaging unit **60** to prevent the yarn from ballooning as it leaves the false twist spindle. In general the yarn guide **70** comprises a length of stiff wire **72** having a small loop **74** at its upper end which is coaxial with the bore **50** of the spindle **12** and serves as the yarn guide, and a large loop **76** at its lower end by means of which it is attached to the housing **14** of the false twist spindle **10**.

In high speed false twist spindles such as shown in FIGURE 1, the rotating members cannot come into direct contact with the lubricant which, at such speeds, would have a retarding effect on spindle rotation. Lubrication is accomplished by providing an annular recess **78** in each of the bores **22***a* and **22***b*. The recesses **78** extend into the legs **20***a* and **20***b*, and are in communication with an oil reservoir **80** which is filled with oil absorbent felt **82**. The felt serves to retard the flow of oil through the porous bearing mount **24** and prevents over-lubrication. Oil may be supplied to the reservoirs **80** by passageways **84** and **86**, and access to the reservoir **80** may be had through cap **88**. During use a sufficient amount of oil or oil vapors is supplied to the rotating members through the porous bearing mount **24** to provide adequate lubrication.

In using the "false twist" spindle **10** of the present invention, the yarn Y, from any suitable supply package (not shown) is passed through the bore **50** of the spindle **12**, around the twist trapping pin **66**, following the helical groove **68**, and through the yarn guide **74** to any suitable take-up mechanism (not shown).

In FIG. 4 there is illustrated a modification of the invention wherein a yarn engaging unit **60'** is provided with horizontally aligned bores **61**, **61'** into which a twist trapping pin **66'** is fixedly seated as by being cemented therein. The twist trapping pin **66'** spans bore **64'** and intersects the axis thereof at an angle of 90°. A V-shaped helical groove **68'** is cut in the cylindrical surface of pin **66'**. The length of the groove may be varied depending on the number of wraps the yarn Y will make about the pin.

In both the embodiments disclosed herein it will be apparent that the angularity of the groove may be formed to any desired value and the groove may be of any desired depth in order that a V-belt or wedging effect of any desired degree may be attained on the yarn. However, the groove opening should be of sufficient width to seat or receive the yarn so that the yarn would be incapable of jumping out of the groove as it is pulled around the twist trapping pin. Moreover, the lead angle of said groove would be sufficient to insure that adjacent portions of the yarn strand would not abrade or rub on each other.

Since certain changes may be made in the above apparatus without departing from the scope of the invention herein involved, it is intended that all matter contained in the above description or shown in the accompanying drawing shall be interpreted as illustrative and not in a limiting sense.

What is claimed is:

1. A false twist spindle for twisting and untwisting yarns comprising, a rotatable member having an axial bore therethrough for the passage of yarns, means for mounting said member for rotation, a yarn engaging element connected with said member and arranged to engage the yarn passing through said axial bore to rotate the yarn, and a helical groove formed in the surface of said element for receiving said yarn whereby to define a helical path for said yarn as the yarn engages said element.

2. A false twist spindle as set forth in claim **1** wherein the opposing sides of said helical groove are inclined to form a V-shaped groove in cross-section.

3. A false twist spindle as set forth in claim **1** wherein said helical groove extends around said element through a path of at last 360°.

4. A false twist spindle as set forth in claim 1 wherein said element spans said axial bore, said element being fixed against rotation on its own axis for sliding passage of the yarn therepast.

5. A false twist spindle as set forth in claim 1 wherein said yarn engaging element is arranged with its axis at an angle of less than 90° to the axis of said rotatable member.

6. A false twist spindle as set forth in claim 1 wherein said yarn engaging element is arranged with its axis normal to the axis of said rotatable member.

References Cited by the Examiner

UNITED STATES PATENTS

2,777,276	1/1957	Klein	57—77.3
3,044,247	7/1962	Hilbert	57—77.45
3,161,706	12/1964	Peters	57—77.4 X
3,180,074	4/1965	Smith	57—77.33

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